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MR. BEMISTER'S
REPORT
ON THE
FLOOD AT BERTHIER,
IN THE MONTHS OF
APRIL AND MAY,
1876.

E.C.R.
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BEMISTER & SLATER,
CIVIL ENGINEERS,
MONTREAL, 5TH MAY, 1876.

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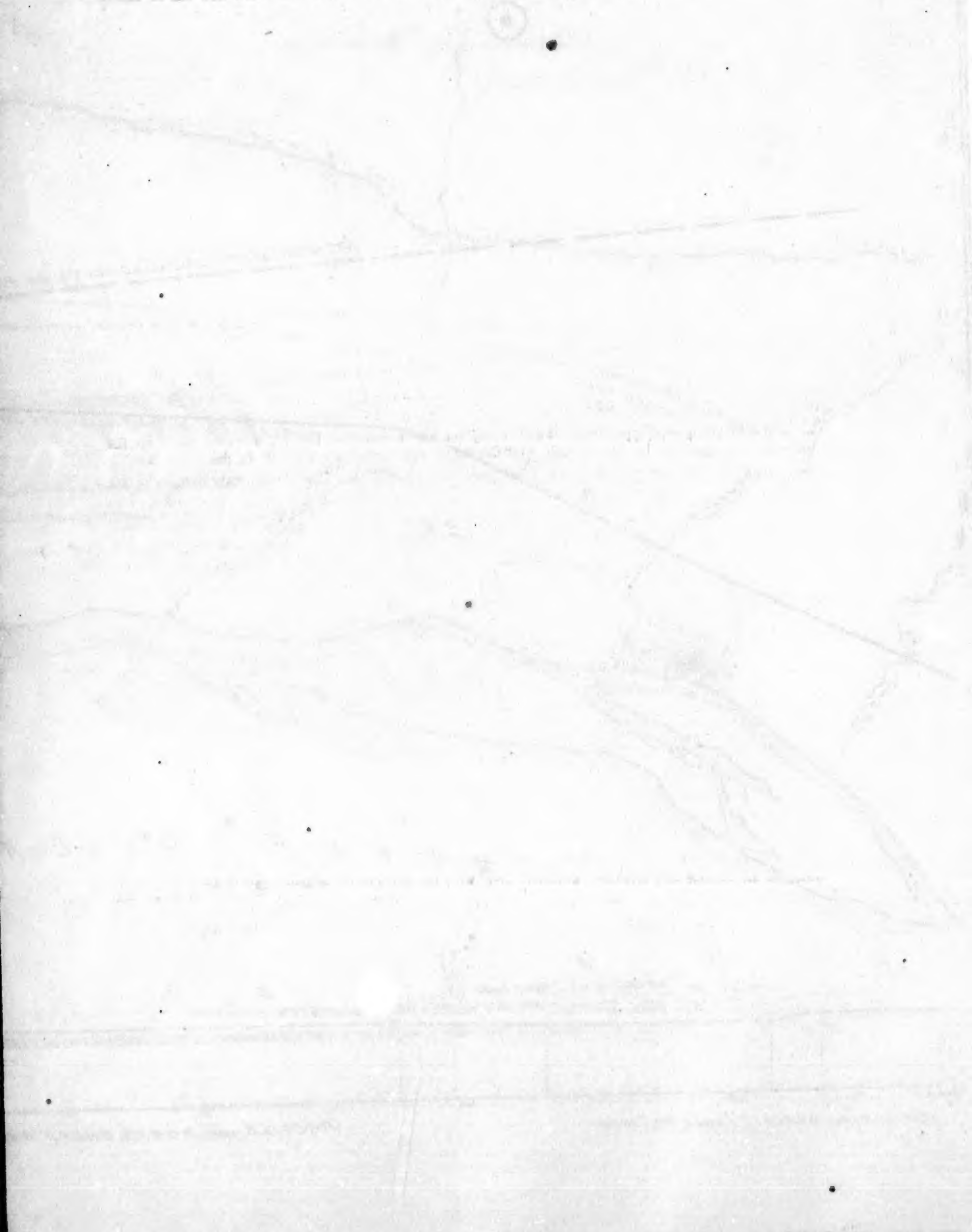
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MAP OF THE COUNTRY

SHOWING THE SEVERAL TOWNS AND VILLAGES
AND THE COURSE OF THE RIVERS
AND THE BOUNDARIES OF THE SEVERAL
COUNTIES



G. Deby Esq. M.P.
Mr. M. Beaudet Comptroller

TO THE MAYOR AND CORPORATION OF THE TOWN OF
JOLIETTE.

MONTREAL, May 5th, 1876.

GENTLEMEN,

Immediately after receiving your request I went to Berthier, and now beg to report to you the extent to which the North Shore Railway Company's Survey line was covered with water during the inundation which reached its height at the end of last week.

In my Reports on the Surveys made in this part of the country, (page 28,) I said, "For twelve miles near Berthier the land is underneath the flood-level. This makes the earthwork so heavy for that route, the banks being six to eight feet high, and even in some places they would be, as shown by the profile, under the flood level. The Company's engineers have very generally described the soil on the route as black muck, as may be seen on their profiles."

"The flood-level shown is taken from the field books of the Company's engineers, and is that of the floods of the year 1865. There was also a flood in 1873." What I thus stated in my reports on the Surveys is fully borne out by my observations on the spot last week.

The flood in 1873 was similar to the present.

The present flood-level is from twenty-four to twenty-eight inches below that of 1865, and yet, with this lower flood-level, the North Shore Railway Company's Survey line was covered with water for nearly twelve out of a length of thirteen miles, between Berthier and Maskinongé. That is to say: Suppose the embankment built on the Company's Survey line, and according to their plans, in a distance of thirteen miles nearly twelve miles would have been in the water, with at one part the top of the bank five feet under the water.

At Berthier the water extended a quarter of a mile inland beyond the line. Between Berthier and the Chicot River the water on the line was an average of two to three feet deep—in places deeper,—and the flood extended here half a mile inland beyond the line. Between the Chicot River and Petit St. Jacques, (opposite St. Barthelemi) the water was over the line more or less. In the road running close to the line in this part the wooden culverts were floating in the water, and in some places gone altogether. Between this (Petit St. Jacques,) and the Maskinongé River, the line was covered for five miles,—for two miles and a half to a depth of from three to five feet, and for two miles and a half to a depth of from five to eight feet,—and here the top of the embankment, if built as shown on the Company's profile, would have been five feet under water, and of course liable to be covered in higher floods to a depth of seven feet. I need hardly point out that running engines and cars through water from five to seven feet deep, even for a short distance, would not be possible. The Railway Company would require amphibious rolling stock for working this portion of the line.

The depths, and the extent to which the water covered the line are all shown clearly on the profile and map accompanying this report.

Between Berthier and the Chicot River whole rows of the fence posts were floated up, showing how the water had soaked the ground, and a boat could be passed over the tops of standing fence posts. I went in a boat through Mr. Cuthbert's grounds and garden over the bushes. Some of the farmers had their fence rails stacked, but a great number must have floated away.

Having by this statement of the facts, and by the map and profile, shown the extent of the flood, a few remarks will now be in place.

It is to be noticed that although the blue color on the map shows the land that was entirely covered by water, so that it seemed to be part of the river, or, rather, looked as if it was a great lake, yet the general level of the land between this covered portion and the Coteau (shown on the map) was only a few inches above the water. Thus to within half a mile of St. Barthelemi and the Coteau, the water in the ditches and streams was nearly level with the surface of the land, and in some places the water was over it in large patches, making it a great marsh. The nature of the land being "boggy,"—to call it by the descriptive term made use of by the Company's Engineers,—although the land might not be covered with the water, still the subsoil would be soaked, so that if heavy railway banks are built they would settle at such seasons as these, and the result would be very heavy expenses for repairs. Of course for a short distance this consideration might not have much weight, but it becomes serious in this case from the fact that in the distance between the Ottawa River and the other side of the Maskinongé River, say forty-five miles, nearly twenty miles are more or less under water during floods similar to the present. Embankments built on soft soils constantly sink and spread, even where great care has been taken in their construction by removing the "black muck" from their foundations. Where the subsoil is likely to be flooded, in the wet seasons, the banks

become not only a source of trouble and expense, but of actual danger. Many railway accidents have occurred from this cause. The action of the embankments on such soft soils may be illustrated by facts in the knowledge of any one; for instance, in the case of roads over soft soils the gravel will sink out of sight, and leave the ground as if no stone had ever been put on them. Even where year after year gravel has been put on, the subsoil will still come to the surface, while the gravel sinks. This, indeed, is the great difficulty in the way of forming good roads and pavements. The action of the embankments on soft soils which are but a few feet above the level of the natural drainage of the country will be still more evident to any one if the formation of the soil is considered. The lower part of the subsoil, formed under water, is usually a peat, often of great depth. The growth of this, and perhaps the fall of the water, takes it above the ordinary level, so that it becomes flooded periodically only, but at times when the water is loaded with earth brought from the higher lands and river banks. This sediment, settling on the peat, forms a strong layer of clay and sand. The periods of flood over this becoming more extended in their succession, there is a growth of the class of vegetation usually found in marshes, which in the course of time forms the surface soil called by the Company's engineers, "black muck." If on such a soil as this a railway embankment is built, heavier than the substratum of clay and sand can bear, it will break through into the peat beneath, and great trouble and expense be the result.

The sinking of the embankments, which would surely take place to a greater or lesser extent every wet season, is, however, by no means the only, or even the worst, trouble to be expected. It must be remembered that while the rise of the flood is usually gradual, the fall of the water is very rapid. If, therefore, there should be an embankment across the country, an immense body of water would be suddenly left on the inside to which the bank would act as a dam. Built, as it would be, of the very worst description of material for withstanding the action of water, and completely undermined and soaked by the flood, any one can easily picture to himself the damage to the line that would result over such an extent of flooded country. Any one who has read the newspapers during the past eighteen months will understand how seriously the railway traffic and property might be affected. Reports of damage to railways from floods have been constant, from all parts of the world, and a great number of accidents have occurred in consequence, with loss of life and property. I mention a few instances that come to my mind at the moment. A short time ago, in the States, an engine was destroyed by bursting from running into water on a portion of the line that was submerged. A line was reported "damaged to the extent of over \$100,000. The road-bed badly damaged for twenty-one miles." At the same time another line was reported damaged, "track under water a mile and a half." A few days since (May 1st) the Union Pacific Railroad was reported "washed out a few miles east of Ogden, and eight cars ran into the river there this morning. A bridge of the U. C. Railroad is in peril, and the cars are pushed across by hand. Prospects of greater damage." In fact, instances of accidents, owing to floods, might be given in any number.

The accidents show that the utmost vigilance, during the season of flood, will not prevent loss to the railway company. Often the break in the embankment takes place suddenly; a culvert gives way, or a bridge is damaged, and then there is an accident. Instances of accidents from flood occurring on local railways will be fresh in the memory of many. A good idea of the danger and of the damage likely to happen to a railway in these floods, would be gained by any one travelling over the roads at the time of one of them, by seeing the number of road-bridges and culverts damaged or broken up; often necessitating going long distances out of the road, or across fields.

Two great causes operate to produce the floods in this part. The chief cause is the damming up of the St. Lawrence river by ice. The other, the water coming from the interior. The present flood was caused wholly by the St. Lawrence, the flood having occurred in a month of the finest weather, when the only water coming from the interior was from the snow melted by the sun. The rainy season had not commenced. It may be conceived how much greater the flood would have been, and how much greater the damage would have been, had the two causes combined, that is, had the flood taken place during the rainy season. Whenever there may be such a combination of circumstances, there must be extreme flood; then, of course, the danger to any railway embankment would be greatly increased.

The present flood is to be considered as one of the ordinary floods, and not as one of the extreme floods. I am convinced of this from the opinions of people living on the spot, who spoke of the water "as not very deep." It occurred, as I have said, in a month of fine weather. Then, too, there is the fact, that although floods were anticipated, yet in places where they are usually felt most severely, in Montreal for instance, the water only rose high enough to flood a few basements. This is sufficient to prove that the extreme floods rise much higher than the level of the water during the present one.

The question will naturally be asked, as a point to be taken into consideration, how often do these floods occur? My examination convinces me that the following are correct statements.

The water rises to such an extent every season, that although the land crossed by the survey-line may not be flooded, except for a mile or two, yet the level of the water is very close to the surface, so that the subsoil is flooded for twelve miles or more between Berthier and Maskinonge.

Every three or four years there is a flood similar to the present and to the one that occurred in 1873.

Once in every ten years an extreme flood, similar to that of 1865, is to be expected.

The result of the flooding of the subsoil every season, would be the sinking and damage of the embankments. There would also be great danger of accidents for two or three months in the year, during the Spring and Fall. The possible interruption to traffic, during the continuance of the floods, especially just before the opening, and at the commencement, of navigation, would be very serious to the railway interests.

So great is the danger and risk in placing an ordinary embankment across such a stretch of country, that, if my proposed route to Joliette were to be adopted, I should advise that the line between the Chicout and Maskinonge Rivers should be taken about a mile nearer St. Barthelemi and Maskinongé, than it is shown on the accompanying map by the dotted thick line. The cost of building a *first-class* road across this flooded land would be very great, compared with the cost if put nearer St. Barthelemi and Maskinongé. The embankment must be from two to three times higher. A greater number of culverts must be built, because there would not only be the water from the interior to be carried away in the rainy seasons, but the immense body of water that would be on the inside of the embankment, during the floods, must be provided for. If the line is put nearer St. Barthelemi, it would only be necessary to provide culverts to carry off the water coming from the interior. Great care would be necessary in putting in the foundations of the culverts to make them secure by piling and other means. The "black muck" of the surface soil would have to be thrown out of the foundations of the embankments, and the embankments themselves would have to be made of sound material, brought from a distance, so that none of the "black muck" should be used in their construction. The bottom of the embankments would have to be well protected at the culverts. It is only by precautions such as these that a first-class railway can be constructed over the flooded land. Even with these precautions the damage during floods would surely be very great, and the interruption to traffic considerable.

The North Shore line will be one of the great passenger lines, and, as over these through lines people prefer travelling at night, there will be great danger to life for two or three months in every year while the wet seasons last. There will be this danger even with the best precautions taken in the construction and maintenance of the line, if it is carried over this flooded portion of the country.

During the present flood there were at least 25,300 acres of land under water in this part alone, occupied by a population of 3,600 people; 500 dwelling houses standing in the water.

In order to prove how very seriously the floods would damage and interfere with the working of the line, if built according to the Company's plans and profiles, I need but point to one fact. If the line had been actually constructed previous to this flood, *the top of the embankment would have been at one part five feet under water*, and this is the case, although the grades have been raised a foot or more throughout, above what they were laid down on the original profiles. From this cause the traffic would have been stopped for some length of time, just at the season when freights must be moved briskly over the road to be ready for navigation. To say nothing, then, of the damage to the line, great loss would have been suffered, not only by the Railway Company, but also by those whose freight was delayed.

This fact is sufficient to show that the location of the line in this part must be altered.

In order to give an idea of the state of this part of the country during the flood, in the following I give a brief description of the appearance of Berthier:

I might write a great deal of the discomforts of the journey down from Montreal to Joliette; of the stretches of road covered with water which had to be driven through; of crossing the river at Bout de l'Isle; of Bout de l'Isle village, flooded to the tops of the garden fences, and its people going about in canoes; of the road between Bout de l'Isle and L'Assomption, where it was necessary to go over fields and field ditches, some distance out of the way, because the road bridge could not be crossed; of L'Assomption village, with the water in the streets; of driving till after three o'clock in the night over almost impassable roads, where the shafts were broken off and the wheels damaged, making it necessary to call up people twice on the road to get ropes to tie the parts together. A description of the woes and woful plights of this journey would be equal to anything that travellers in the wilds of India have gone through in the wet season.

When within a mile or two of Berthier, although we had crossed many fields and jumped the horses over any number of ditches at the risk of breaking everything, including the horses' legs, I began to think the reports of the flood had been exaggerated. Immediately, however, we came to a flooded part of the road. Passing through this, standing on the carriage seat, the water was so deep that it covered the seat five or six inches, and this was certainly an earnest of the scene to follow.

The town of Berthier was standing in a great lake. For miles, as far as the eye could see, trees and houses were in the water, not a patch of ground uncovered. It seemed, indeed, as if the trees grew, and the people lived, in water. The weather was so fine that had it not been for the outlines of fields, marked here and there by rows of fence posts showing just above the water, anyone might have supposed it to be the ordinary state of things. Driving through the water into the town, on reaching the church, I saw that reports had not exaggerated the extent of the flood. Water was undisputed possessor. Water, as if acting as a bailiff, had put distress into every house. All business was at a standstill. Most of the people were engaged in watching and pursuing portions of their property that the water was carrying away.

The side-walk was floating on the street leading from the church, and also on the front street that runs along near the wharf. These side-walks were tied to the trees and fences, to keep them from floating away or breaking up. These were the only streets that had a plank, and this on one side only, that could be walked on for any length, and on it we had to walk in single file, and keeping apart from each other, or the weight would have forced it under the water. At one part of it the only bridge was a fence with two rails out of the water. On the lower one the feet had to be placed and then, clinging to the upper, by a side-way motion, the water was crossed. For some reason or other, this was the only means of passing over this part provided for, or by, the inhabitants. For some days I saw the agility of the ladies much exercised at this pass. Doubtless each tenant looked after the portion of side-walk immediately in front of his own house. The owner of the fence must have thought he had done his duty to the public in providing such a strong fence for their accommodation. It is a surprising thing that common as these floods are, the people should build their houses with the ground floor not only below the extreme flood-level, but even below the ordinary flood-level. Hardly a house in the place has its ground-floor above the extreme flood-level, and very few above an ordinary flood-level. There are some very nicely built and pretty houses in this town, and it was pitiful to see the well painted, well papered dwellings with water over their floors. Especially when this water was a liquid mud made up from the soakings of privies, manure-heaps, pig-sties, and filth of all kinds. Anyone might be pardoned for thinking that the basements and rooms would never get dry or purified again. In this front part of the town, the floors of the houses are highest. In some houses all the furniture had been removed into the upper stories, where the people were living; in others the stores and tables, perhaps were left standing in the water. Barrels with planks across them were placed in the rooms by which the people reached the stairs from their canoes.

The back part of the town was in much the worst condition as far as the state of the houses went. The water was in many of the houses half way up the windows, and some of the windows were covered to their tops. In these houses the people were living in the roofs, and either they had little furniture, or themselves and their furniture must have had pretty close quarters. Except for the signs of life in the upper stories, and in the windows of attics, and for the people passing about, and engaged in various occupations, in canoes, the town looked as if plague stricken and deserted, or as if the havoc of war had driven the people away. This deserted look was caused from most of the houses having their doors and windows open or taken out, showing the empty rooms. The appearance of desolation and destruction is only to be realized by anyone who has seen some similar inundation. In one place a man had formed a boom inside of which he was throwing fence-rails, planks, and other wood that he was saving from floating away. Here, a hen or two was standing on a manure heap just above the water; there, two or three hens were standing on a floating door, looking very forlorn. In another place a pig was lying dead. The privies were in all sorts of positions, some with the roof just above the water only, some half way over on their sides, others fallen backwards. A man was standing in his canoe and hanging clothes to dry on the eaves of his roof, which was just about the height of his chest. Another man, crawling from his canoe through what was left above water of his doorway, turned to us and remarked that his "door-way was growing smaller." Even the smith's shop seemed to be following the general state of things, for the anvil appeared to be floating in water like everything else. Some of the houses had the water up to the windows; the only things left in the rooms being the flowers in the windows, showing what comfortable little homes they were before the flood came.

Every house had its canoe, and the knowledge of how to make a flat-bottomed canoe must be more general in this town than in any other place in Canada. A vessel or two and a post standing above the water here and there, were the only signs of a wharf. The baker was going round with a boat-load of bread, calling to people in the houses, asking if they wanted any. A woman in a canoe was carrying a slop-pail to empty it away from the houses, of course into the water. That the people were not generally poisoned during this flood would seem to prove that filth, taken internally or externally, is not injurious.

In such a time there are many amusing scenes, although to the poor people the thing must have been far too real to be amusing. The roof of a house that was just above the water had a cat sitting on its ridge. In a yard, a well just showed its roller and chain above the water. I think that that well had more water than would have supplied all Canada, and one or two other countries beside. The Telegraph office was reached by walking on planks placed across the rooms on barrels. It was comical

to see houses, half their height in water, with the Fire Insurance Company's tin plate over their door. The town seems to need insurance from water rather than from fire.

On one day, going in a boat inland beyond the town, the waves ran so high that we were in danger of being swamped. The boatman was quite frightened, and we had to make for the land, and walk.

This brief description of facts will give a better idea of the flood than any mere statement of the depth of water, here or there, over the land. That is why I have given it, and especially because only the inhabitants see the place at such a time,—no one thinks of travelling, there are no stages running, for the roads are impassable all over the country,—and any one seeing the town in summer time would not be able to realize the fact of such a flood as the present, to say nothing of floods higher than this. In summer the water is some nine feet below the wharf, while in this flood nothing could be seen of the wharf or the road near it, and the houses had the water over their floors. I may mention another fact,—there was ten feet of water over the ground where the North Shore Railway Company's first survey line was located.

In conclusion, I may say that the interests of Berthier would suffer little, if anything, from the placing of the line a short distance further inland than it is now located. It is quite necessary, in the interests of the Railway, that it should be built out of reach of these floods, even if the line is to follow the same route. Anything that the town of Berthier might suffer from the line being moved further from it, so as to follow the route to Joliette, would be far more than compensated by being placed in communication with the interior of the country, and with such a growing, enterprising town as Joliette. It must be remembered that the places along the St. Lawrence River, like Berthier, depend for their growth on the traffic and trade of the interior. The interests of Berthier, therefore, will be best served by this connection with the interior. If the Railway is built on the route of the Company's survey line all the traffic will pass Berthier; but, on the other hand, if the line is taken to Joliette, then Berthier becomes the nearest harbor, and the traffic seeking navigation would naturally reach Berthier. To illustrate this further:—The line is at present under construction from Quebec to Three Rivers. Suppose between Three Rivers and Joliette the line was put twelve or fifteen miles inland. In that case Three Rivers would become the only harbor at which the traffic coming from the interior for navigation could ship; then Three Rivers would have the monopoly of this traffic, and a very large proportion of the freight traffic is such as will seek the navigation as soon as possible. Berthier is so situated that, if the Railway is built on the Company's survey line, none of this interior traffic will find its way to her. Nothing can prevent the Town of Joliette being the centre to which the traffic will flow for all that part of the country, and this traffic will be carried by the present Railway from Joliette to the St. Lawrence. A glance at a map will show that Berthier is so placed that under these circumstances the traffic would pass on both sides without benefitting the Town at all. If the Railway is carried by way of Joliette and Terrebonne, as I have advocated, then Berthier will be the nearest harbor to Montreal on the main line, and the growth and advancement of the Town from this cause would certainly be great. If I were advocating the special interests of Berthier, I could not do it better than by advising the adoption of the route by way of Joliette and Terrebonne. The fewer the harbors connected with the main line, the greater will be the benefit to the towns that are so connected. I here conclude my Report,

And have the honor to be,

Gentlemen,

Your obedient servant,

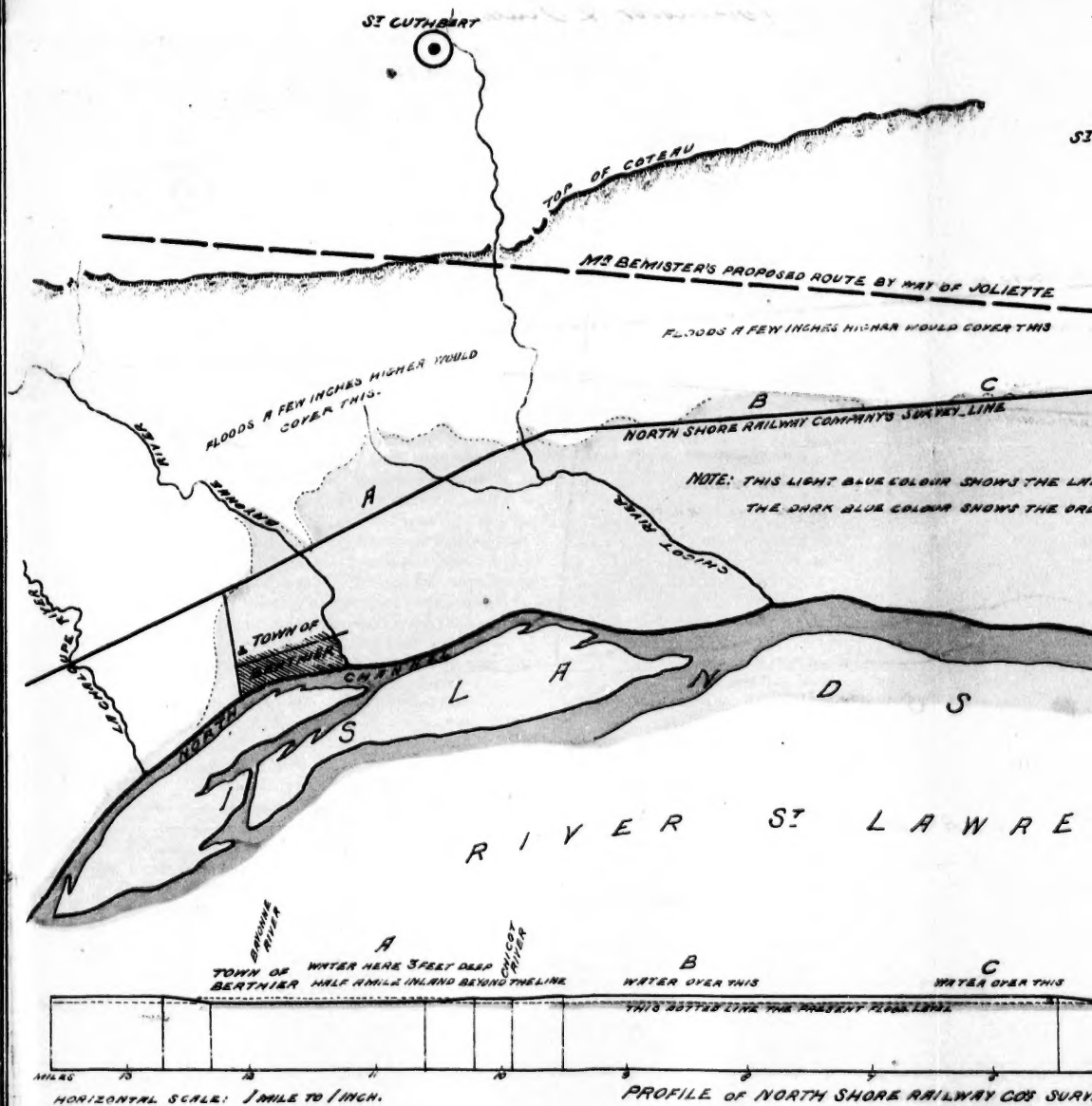
GEORGE BEMISTER.

MAP OF THE COUNTRY NEAR BERTH

SHOWING THE EXTENT TO WHICH THE NORTH SHORE

SURVEY LINE WAS FLOODED IN THE MONTHS OF APRIL

SCALE OF THE MAP ONE MILE TO ONE INCH



RR **BERTHIER** _____

NORTH SHORE RAILY COMPANY'S _____

MONTHS OF APRIL AND MAY 1876 _____

ONE MILE TO ONE INCH _____

Minister & Slater

Civil Engineer

Montreal May 5. 1876

